

# 1 IRON DRAGON USER



*The independent Dragon magazine*

99p US\$3.25

February 1986



Dragon's Third  
Dimension  
6809 Show Report  
People's Chart

Incentive Compo  
25 games to be won



# DRAGON USER



Telephone number  
(All departments)  
(01437) 4343

Editor  
JOHN COOK

Production Editor  
BARBARA HAJEK

Software Editor  
GRAHAM TAYLOR

Editorial Secretary  
LUCINDA LEE

Advertisement Manager  
SIMON LAWTON

Administration  
GERALDINE SMYTH

Managing Editor  
PETER WARLOCK

Publishing Director  
JIMMY IRVING

Subscriptions  
UK: £14 for 12 issues  
Overseas (surface): £20 for 12 issues

0094 0205-6177, Telex: 266275  
Dragon User, 12-13 Little Newport Street,  
London WC2N 6PP

US address: c/o Business Press  
International, 395 East 47th St, New York,  
NY 10017

ABC

Published by: Sunshine Books, Scott Press  
Ltd, c/o Sunshine Books 1980

Typesetting by Chapman Press, Chesham,  
Bucks. Printed by Christopher Harrison  
(Southern) Ltd, Southampton-Gos. Essex  
Distributed by B.M. Distribution, London  
0194 0124 8611, Telex: 266240

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## How to submit articles

The quality of the material we can publish in  
Dragon User each month will, to a very great  
extent, depend on the quality of the  
discoveries that you can make with your  
Dragon. The Dragon computer was launched  
on to the market with a powerful version of  
Basic, but with very poor documentation.

Articles which are submitted to Dragon  
User for publication should not be more than  
5000 words long. All submissions should be  
typed. Please leave wide margins and a  
clear space between each line. Programs  
should, wherever possible, be computer  
printed on plain white paper and be accom-  
panied by a tape of the program.

We cannot guarantee to return every  
submitted article or program, so please keep a  
copy. If you want to have your program  
returned you must include a stamped,  
addressed envelope.

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With Valentine's Day in the offing, Gordon  
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25 games to be won from those old  
workboxes, Incentive Software.

# Editorial

In days of old, so ancient myths tell, Dragons were solitary beasts, hiding  
away, keeping themselves to themselves, guarding their hoards of treasure.  
And I guess the same used to be with Dragon owners.

When you could nip into W. H. Smith to buy your favourite game, or pop  
into your local computer shop to check out some new peripheral. When you  
could ring up the manufacturer for technical advice, and repairs and spares  
were easy to come by. In that mythical dim and distant past, Dragon owners  
could be as solitary as they liked.

Now this is not the case at present. With the mail order trade almost  
taking over completely, things are no longer that easy for people with a  
Dragon, which is why events such as the 6809 show (and others) have  
taken on a new importance.

News is looking good on that front — a show in Cardiff this Spring; a  
follow-up to the Dragon weekend is currently being organised. Microdeal  
are organising two Dragon conventions for later in the year and Database  
Publications (who have taken over the 6809 show) seem keen to hold both a  
provincial show (probably in Manchester) as well as a London event. You're  
almost spoilt for choice in fact.

However, this blossoming of events forms a crossroads in the destiny of the  
Dragon. If well organised and well supported, they could trigger a  
Renaissance for the machine — if the opposite occurs the Dragon will be  
well and truly relegated to the category of 'Has Been'.

The opportunity and enthusiasm are there — the rest is up to you.  
Answers on a postcard please. ...

## Show time in South Wales

IT'S 0400H time again — this time in Cardiff. John Penn Discount Software and others have rallied round to organise a show in South Wales — Cardiff Airport to be exact — on Saturday, 15th February. The show runs from 10am to 5pm and entry will cost £1.50 for adults, 50p for the under 16s.

"We feel it's important to have this show for Dragon Users," said Hugh Pearson, speaking on behalf of John Penn. "With less and less retail outlets, it's important to

get out and let the Dragon Users meet the people behind the Mail Order outlets — let the customers place a face to the voice on the phone."

Exhibitors include: John Penn Discount Software, Computape, Compusense and Peaksoft.

Also Design Design, Baby Computer Games and Grosvenor Software.

Anyone wanting further details (including potential exhibitors) should contact Helen Penn on 04303 5870.

## Extra Incentive

WERE YOU one of the eager arcade freaks trying to win the Eddie Steady Go! competition at the 6804 show recently? Well, incentive are pleased to announce the winner of the competition — a Mr Kevin Ross of Headington Close, Basildon. On the Saturday of the show Kevin pulled his way to a score of 9858 — and for this effort gets a prize of £25. Congratulations!

Never let it be said that incentive software do not live up to their name. All purchasers of their imminent release Moon Cresta (based on that famous arcade game) will have automatic entry to a competition to win a spanking new Moon Cresta arcade machine. You'll have to invest a fair few

hours playing the game though... a score of 30,000 qualifies you for entry to the big prize draw. Go for it!



## Close up

ELECTRONICS enthusiasts everywhere have been waiting with bated breath for this one — the Pocket Inspection Microscope from Cobonic Limited.

These handy self-illuminated pocket microscopes are around six inches

long, and weigh in at four and one half ounces. Cobonic are producing two models, the Spring-30 (£118.00) which provides 30 power magnification and the Spring-120 (£27.00) which provides 120 power.

For further information write to Cobonic at 32 Ludlow Road, Guildford, Surrey, GU1 5HW, or telephone 0463 555280.

## Roysoft?

ROY COATES, author of the Jet Set Wily and Marie Minor Dragon conversions, is set to launch his own software label in the New Year. Called Microvision, it will concentrate exclusively on "high-quality" Dragon tape software. The first two titles are both arcade adventures, one called Deus-stakes, the other The Tale-man. Roy is suitably mysterious about the details of plot concerning these releases, and their price, but expects both to be available around the beginning of February.

As well as programs penned under his own name, Roy also has plans to market third party software. "I got a lot of letters criticising other people's code

— but not writing any themselves!" he said. "We're looking for programs!" He added enigmatically, "Whatever happened to Messenger Pete?" Inquiries to 25 Cleavelly Road, Alton, Liverpool, L81 5AH.

## Disk tool

REPROD: Knechtel Software (no, it's not a misprint), a new German enterprise which describes itself as "a company which only produces good tools and utilities instead of worse games for your Dragon," have just released their first product, Disk Support tool 1.1.

For further details, write enclosing a SAE to Bernd Knechtel, Software at Knechtel-Software-GbR, 9, 9520 Pommersfeld 11, West Germany.



## Show time yet again!

FOLLOWING last autumn's successful Dragon "Weekend in Wales" (see Dragon User Jan 1986), Bob Morgan is organising a follow-up venture, to be held at the Trefeddon Hotel, Aberdovey in Gwynedd, over the weekend of 21st-23rd March. Events over the weekend planned are talks, demonstrations on a variety of

subjects including Modems, Interfacing, Eeprom blowing, Operating systems — and much more!

The cost, fully inclusive of accommodation and meals, will be £45 per person. Last year's event was subscription, as Bob advises anyone interested to look early. Contact him via the Mid Wales Tourism Council, Machynlleth, Powys, SY20 8EE. Tel: 0554 2854.



HERE IT IS! The 22 screen, 60 level. See Sawing, Frog Slurping, Lift Catching, Apple Munching, Mind Blowing, Eddle Guiding, Arrow Dodging, Mountain Jumping, Laser Zapping, Airship Gazing, Boulder Hopping .....

# EDDIE STEADY GO!



## PRIORITY ORDER FORM

Please rush me the titles as indicated below for my Dragon 32/64 computer.

**EDDIE STEADY GO!** £7.95 ☐

Back Track (Eddie's first) £5.95 ☐

The Kall Trilogy of Adventures £9.95 ☐

I enclose cheque/P.O. for £..... or please debit my credit cardline.

Name/Address .....

INCENTIVE SOFTWARE LTD - 54 LONDON STREET, READING, RG1 4SD

Credit card telephone orders - Ring (0734) 501676

## Pokes Galore!

Here are some more routines and pokes that I have discovered.

**INVASERS REVENGE** — POKE 14718.n before typing EXED, where n is the number of lives left 0 to 255.

**DONKEY KING** — GOFFP CLOARD.n to load, POKE 12914.n before typing EXED, where n is the number of lives.

**PLANET INVASION** — POKE 7030.n or POKE 10906.125 for infinite lives.

**SCARFMAN** — Load as normal, POKE 2082.0 gives 256 lives.

**LUNAR ROVER PATROL** — POKE 2220.n.

**GORIS THE BOLD** — POKE 18111.n.

**KATAPILLAR ATTACK** — GOFFP CLOARD.n to load, POKE 10739.n before typing EXED.

**CRAZY PAINTER** — Type programme A listed at the bottom of the page. When loaded, POKE 9953.0 where n is the number of brushes and pots of paint to a maximum of 84.

Then type EXED 10304.

**CUTHBERT IN THE JUNGLE** — Type programme A to load. Then type POKE 11482.n EXED 10304.

**SPRIMABLE** — Type programme A to load. Then type POKE 7380.n POKE 7381, start stage number EXED 0090.

**CUTHBERT GOES PRODIGY** — Type programme A to load. Then type POKE 11475.n EXED 4099.

**HUNCHBACK** — Load the game as normal. When running press the RESET button and type POKE 25284.n EXED 25286.

**TOUCHSTONE** — Load as normal and press RESET when asked for a few players. Then type POKE 22364.255 EXED 10304. This slows down the generation of new invaders.

**GALACTIC AMBUSH** — Load as normal, press RESET when you have selected the colour and speed. Next type POKE 14783.125 EXED 12606. This gives infinite lives.

**COSEMIC ZAP** — Load as normal and press RESET during a game. Then type POKE 7081.13 EXED 13898. This gives infinite lives.

**DEVIL ASSAULT** — Type programme B as listed at the bottom of the page. When loaded, POKE 14276.n EXED 758.

**CUTHBERT GOES WALKABOUT** — Type programme B as below. When loaded POKE 15389.33 makes you immune to the shorlens and POKE 14308.125 gives infinite lives. Finally type EXED 768.

In all the above cases, n stands for the number of lives which you would like, and should be substituted for the number. It ranges from 0 to 255 unless specified.

I'm sure these pokes will be a great deal of help to many readers.

**Program A**  
A = 150 POKE A, 143 POKE A + 1, 4 POKE A + 2, 0 POKE A + 3, 126 POKE A + 4, 180 POKE A + 5, 91 SHIFP EXED A

**Program B**  
A = 3000 POKE A, 155 POKE A + 1, 180 POKE A + 2, 140 POKE A + 3, 104 POKE A + 4, 57 POKE A + 5, 155 POKE A + 6, 7 POKE A + 7, 103 POKE A + 8, 57 EXED A

Games Alliance  
(Alan Paul Borgin)  
41 Mycroft Road  
Sheffield S10 4QS

may help a few of your DELTA DOS users.

R. K. Dobson  
184 Northdown Avenue  
Culvertoe  
Kent  
CT9 2JH

## Barons

HAVING just achieved a 100% score on completion of Barons of Galt V by my wife and myself would like to make the following comments, some of which concern the game review in December's *Dragon* User.

- 1) A roll of wallpaper is not required to map the adventure. My wife produced a detailed easily understood map on a piece of graph paper 17" x 17". The map is complete with location symbols and is in colour.
- 2) With the aid of the map and some initial observation it is possible not to lose lives at savings of every night.
- 3) The problems do get trickier as the game progresses, but with a little thought are solvable, especially at the end of the game.
- 4) As for the girl in the White City, after several Tanya Twists, she will... But that is a problem for other adventures.
- 5) For a different view of the adventure try the following:
  - a) Part load a saved character
  - b) Reload tape
  - c) Fully load the saved character

The results (found by not properly preparing your save tapes) are guaranteed to give a quiet chuckle!

- 6) Barons of Galt V is a super adventure which gives many enjoyable playing hours.
- 7) Finally, proof of our 100% score is in the final message, which can be verified by Winterset, and reads as follows:

... the five flames envelop your vanishing consciousness as you fall through the three-dimensional vortex... to be continued in *Jurassic* part 2; 'Usurper of Time'.

March and Jill Boulton  
4 Maryfield Road  
Moston/Super-Mare  
Aston B52A 7DN

## 6809 Flop?

WHAT a waste of time, effort and cash this year's 6809 show was.

After spending £25.00 on my train fare and £20.00 to get in, I was totally disgusted to find that Tandy and Eddy were the only stalls with software for my Tandy machine, and most of the games on the Tandy stall I had already got.

I know that Tandy have a light rein on licensing but this was ridiculous. All I can say is that this is the first and last time I will be attending this show and for all Tandy owners, I can only hope things improve soon.

M. Johnson  
29 College St  
Bouffon Estate  
Birmingham  
B15 7BD

## No go Show

THIS is the first time that I have written to you. I am writing to let you know if my disappointment over the latest 6809 show held this weekend. I attended both of the previous ones which in my opinion were much more lively, informative and well attended.

For the other shows I arrived early and left about noon when things were getting hectic; but with the usual long queues forming. This time no long queues and not really enough inside to justify the entrance price of three pounds. In fact your magazine covers the latest products and developments much more thoroughly.

I shall of course continue reading your magazine and give the shows a miss. Let's face it I can buy several issues for the entry plus travelling expenses.

M. J. Pinner  
43 Charterhouse Avenue  
Wembley HA9 3SD  
Middlesex

Can man live by magazines alone? Was this show that bad? Answers on a postcard please...

## Delta Dos

DUE to the demise of Premier Micro systems and not much information published by them lately I enclose a hint that may be useful to Delta DOS users.

If you wish to save a machine code program to tape from disk for backup purposes the normal tape pecks do not work.

First LOADM your program then if you PRESS (HOLD) C71 254 + PRESS (HOLD) C71 this will give you the start address of your program.

The end address can only be found by approximation as the DOS loads the whole domain of a program into memory, the end address is therefore found by reading the directory for the length of the program in memory, this is then multiplied by 254 and added to the start address already found by the above method to give the end address.

The save address on Delta DOS is always the start address. I hope that this tip

# THE DRAGON COMES HOME TO WALES

We invite you to meet the leading stockists of Dragon software, hardware and peripherals. Come and pick up some amazing bargains at the Cardiff-Wales airport on Saturday, February 15, 1986.

## BLABY COMPUTER GAMES

See our large range of software for the Dragon and Tandy, including many new games.

## COMPUSENSE LTD.

Flex operating system; Dragon Plus and professional business software; Distributors of Dragon hardware.

## COMPUTAPE

The only software company to make your Dragon chips fry not dry.

## DATAPEN MICROTECHNOLOGY LTD.

Datapen will be demonstrating their light pens and the new Dragon Draw software. Both will be available at special show prices.

## DESIGN-DESIGN

Meet the faces behind the name.

## ECLIPSE-FENMAR LTD.

Eclipse-Fenmar will be displaying TOTAL ECLIPSE. Come along and meet the master gamer himself: Veebo-Zagrod of Grogfax.

## GROSVENORE SOFTWARE

See DRB — the ultimate powerful database system, and All Dream — the best machine code learning and development tool for Dragon and Tandy. Also Morse Tutor, Morse Decoder and Amlor software.

## JOHN PENN DISCOUNT SOFTWARE

Over 80 different titles, from games to utilities, at amazingly low prices.

## PAMCOMMS LTD.

Dedicated to supplying low price, high-quality software for the Dragon.

## PEAKSOFT

Peaksoft are promising Britain's best deal on a wide range of joysticks, books and add-ons — including an incredible £100 discount on the Touchpad Graphics tablet.

**10.00 am-5.00 pm**

**Entrance fee: £1.00 (adults) 50p children (under 16)**

Show to be held in the Conference Room, 3rd floor, Cardiff-Wales Airport, Rhinoceros near Cardiff. For the Cardiff-Wales Airport follow the signs from the M4 and A48. Plenty of car parking available.

Half hourly bus service (No. 351) from Cardiff Centre.

Refreshments available in departure lounge.

For further details ring John Penn: Bordon (04203) 5970

# Communication

Send in your questions, requests, and pleas to Communication, Dragon User, 12-13 Little Newport Street, London WC2

Communication, as defined by the *Extremely Small Pocket Oxford Dictionary*, is the "impairing or exchange of information" ... and this is what "Communication" in Dragon User will be all about too. As commercial technical and software support for our computer wanes, we get ever increasing amounts of mail on a variety of subjects, all asking for help and information — more than our Supreme Brian Cadge could ever handle. So this is your chance to reach many thousands of Dragon owners who might be able to help you — and, of course, if you can help someone — why not drop them a line?

## Shortage

As I am living in Norway I am beginning to feel the shortage of programs for the Dragon Computer. I am the happy owner of a D64, double disk Dragon DOS and some software.

I think I might be reckoned

as a serious user of the D64 ... I want to use it in my work programs. We have some Dragons at school, but we are not getting rid of them.

Please, I want to get in touch with teachers who are using the Dragon in schools. Perhaps we can help each other in getting useful software for our teaching.

Please, send me a letter and we might get into action making/exchanging software for educational purposes. ...

John Egil Haug  
PO Box 18  
N-1652 Rindsey  
Norway

## Transformer

LAST Christmas I eventually received a Dragon 32 computer. After two months the powersack had burnt out. Unfortunately, the computer was second-hand and out of guarantee. I have just read the letters page in the latest Dragon User to find that Touchmaster no longer stock it. Please could anyone tell me where to purchase a new transformer?

John Moore  
7 The Maltings  
Warrminster  
Wilt  
BA12 6JF

MY SON has been the owner of a Dragon for over two years and has built up quite a selection of software and accessories. Unfortunately for the last six months his computer has been lying unused because we have been unable to purchase a transformer. We have written to various firms and asked a computer repair shop, but as it is a sealed unit, we have had no success. Please, please let me know if his computer will ever be in working order again.

Angela Barnett  
Kewborough  
Pebble  
Framingham

## Communication

Stuck for a routine? Need some obscure equipment? Feeling out of it? Fear not — someone, somewhere can help you! Write down your problem on the coupon below (make it as brief and legible as possible) together with your name and address and send it to Communication, Dragon User, 12/13 Little Newport Street, London WC2H 7PP. We'll publish it as soon as we can — meanwhile, maybe there's someone you can help this month!

Problem .....

.....

.....

Name .....

Address .....

.....

# Dragon User People's Chart

"Power to the People" is our motto here at Dragon User — so this month (and every month!) we are now going to offer you the chance to air your personal preferences to the software producers, by voting in the Dragon User People's Chart.

Ever since the majority of retail outlets ceased stocking Dragon programs (so that sales are now even more difficult to assess), the Dragon owner has lacked that one thing any self-respecting man should have — a chart. Loved it or hated it, a chart is a useful thing, if only to check to see if everyone else shares your good taste.

So, ever with the reader in mind, we are now instigating a People's Chart — for you to vote for your top five Dragon programs (games, utilities or applications) each month.

And just to make it that little bit more interesting, this month Microdeal are offering £25 worth of software (all your own choice) to the winner of our associated anagram competition. Who said anything about a competition?

Well, to make things even more interesting than that, we're asking you to construct an anagram from your top three — the cleverest winning the goodies. Give it a try ... you know it makes sense!

## This is what you do

Each month, Dragon User will be compiling its own special Dragon software Top Ten chart — compiled by you!

And each month we will be sending £25 worth of Microdeal software to the person who sends in, with their personal top five, the most original phrase or sentence made up from the letters (you don't have to use them all) in the titles of their top three programs.

You can still vote in the chart without making up an anagram — but you won't be in with a chance of winning the prize.

All you have to do is fill in the form below (or copy it out if you don't want to damage your Dragon User) and send it off to: People's Chart No. 1, Dragon User, 12-13 Little Newport St, London WC2H 7PP.

## Chart One

Voting for Chart No. 1 closes at 1pm on Friday 14th February 1986. Entries received after that time will not be eligible for inclusion in that month's voting. The editor's decision is final. Only one entry per individual per month will be allowed.

My top 5: Voting Month 1

1. .... Name .....

2. .... Address .....

3. ....

4. ....

5. ....

.....

.....

.....

My phrase is: .....

MOVE OVER POLE POSITION HERES -

# SPEED RACER






Take your choice of 4 circuits then race from the cockpit of a Formula 1 Car

One of the best games I've seen for ages - Dragon User



Available for  
Dragon 32/64 cassette £8.00  
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Tandy colour 32K cassette £8.00  
(Available only at Tandy Shops)  
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Tandy version available at **TANDY** Shops  
other versions available on  
our 24 hour service

By phone **0726 66020**   

By post to **MICRODEAL**  
41 Truro Rd. St Austell,  
Cornwall PL25 5JE



## MICRODEAL

# Show Business!

*He came, he saw, he did a little shopping — Jason Orbaum gives one man's opinion of the Third 8809 Show . . . his own*

OVER the weekend beginning the 21st of November 1985, some 7,000 people (estimated by the organisers) found their way to the Royal Horticultural Halls, London (and I mean found, this was the first time that I have not become lost on the way!) for the latest show.

On arrival I must admit to being a bit worried, as when I drove past the outside of the hall I saw there was no queue. Indeed, when I got inside, there was room to move; in fact, there was room to break-dance! This situation changed quite fast though and by late morning there were a fair number of people buying, chatting, and playing.

Most of the firms one would expect were there. However, Design Design (rumoured to be due to a mix-up of dates), Cattle, and Adventure International were notable for their absence (although the Scott Adams adventures were on sale from Computape).

So, having had a brief, anonymous look round, and been greeted with an enormous degree of friendliness from most firms, I put on my official Dragon User hat and then set off to talk to various people in detail.

## Microdeal

I suppose I had to talk to the giants first. They were there with the usual cube of screens displaying their latest and best games — one of which, *Shocktrooper*, is reviewed elsewhere in this issue — and selling an immediate range of titles over three stalls.

As most people are now aware to achieve games from Microdeal you have to resort to mail-order. There is a very good reason for this, according to their director, John Symas, "it's the only way for us to carry on." It is really blamed on the fact that sales in general have declined for Microdeal. However, I am pleased to be able to say that the experience of Microdeal's mail order service reveals it to be very efficient (now).

Their recent roadshow, they say, has achieved a moderate success, and although profits have been low, they have enabled Microdeal to maintain a very high public profile for themselves and the Dragon.

And the mind of Microdeal has not been dormant. They have been busy scheming and plotting for a "Dragon Convention". The convention would be very different from the show, such as this one which have been described by many as a form of "Dragon Owners' Jumble Sale." The con-

vention would be in London or Manchester most probably, and Tandy amongst other firms have pledged their support. The convention would feature less stalls, but would include guest speakers, and, indeed, the event could well be an overnight affair at a hotel.

As for what's new on the games front, Microdeal have acquired the rights to my rave of several months ago, *Screaming Abolabs*, and are planning to release a new adventure ("We find that adventures have a very long shelf life", John Symas again). The *Horror Factor*, plus a 3-D Battlescape which is not only cheaper, says they, but BETTER than *Romance Heaven*, and a game entitled *Aquarius 471*.

John also pointed out to me that at the back of BYTE magazine one can find adverts for the Dragon computer "from the BBC". . . . Hmm, the plot thickens!

In all, Microdeal's attitude to the Dragon is VERY optimistic, and surprisingly real.

## Cumana

Cumana now offer Dragon-Dos with their disk drives other than Data-Dos, but I was unhappy to find that this is not their Dragon-Dos, in fact, Cumana-Dos (as it is called) is only "compatible" with Dragon-Dos, whatever that means.

Cumana continue their after sales support through their Guildford office, and still offer drives up to a double drive, double sided, 80 track, Double Density configuration.

## Incentive

Incentive had enjoyed a very good show with *Flitte Steady* (or selling well and the Karl Pripple enjoying a continued steady sale (by Microdeal). They saw no reason for not attending the next show to launch or promote their game *Moon-Creasts* which, licensed from Nicholson who produce the arcade game with the same name, should be available in January or February.

Incentive were offering a twenty-five pound prize to those who put up the best score of the weekend on *Flitte Steady* (or . . . I didn't have the heart to win it).

They pledged continued support for the Dragon professional upon sales of *Moon-Creasts* (yes, it sounds a bit dodge to me too).

## Baby

Baby felt that the show had gone extremely well, although they felt that from about 2.30 onwards on the first day it was a bit of a

disappointment (a feeling echoed by many of the other firms present).

They were interested in how sales would go through winter and were soon to release *Sherman Jones*, the sequel to the superb *Diavols of Chaos* based loosely around the Spectrum game called *Lunar Jernan*, and version of *Q\*bert*. Some of their other new releases to be reviewed soon include a *Kang-Pu* game (the first of three I received at the show).

Baby were an exceptionally open and friendly company who had most of their programmers present at the show and were quite happily chatting with anyone who came to the stand, not just reporters. They told me that *Cosmic Crusader* was written without an assembler, in hand coded — someone give that programmer immediate entry to the Massachusetts Club of Great Britain!

## John Penn

John Penn described the show as "the best we've been to yet". As many people know, they have bought up all of Webster's old stock and are selling great amounts of software at a great discount including *Mario Moon* at four pounds! The company's policy is one of continued support of the Dragon while "looking" at other computers.

## Computape

Computape were the most pleasant people I met all day. Their enthusiasm and love of the Dragon, together with their sense of business acumen, made them a firm which deserves and will get support.

Computape described the Saturday as bad but the Sunday as, "amazing", in terms of sales and enthusiasm. They are also trying to arrange a show, this one in Wales, for which they have support from, among others, John Penn, Peacock, Windsorsoft, Grosvenor software, and Computape.

They are now the sole supplier of Cattle Software and they have the license to a game called *Ninja Warrior* (reviewed soon) and the infamous *Madness* and the *Blackout*.

Their enthusiasm comes from the fact that their head man was, originally, a Dragon owner and is still a great enthusiast . . . he knows what he wants to sell, because he knows what he likes to play! Computape were also representing Adventure International at the show selling a good number of the Scott Adams adventures on

the Dragon. Asked if they would continue their support of the Dragon they had one word: "Absolutely."

## Quickbeam

Sales of Quickbeam software were, apparently, down on those of last year, but they promised continued support provided sales of their new games are high (hmm, repeat that somewhere before!).

Their latest releases are 6809 Express and the soon to be released Shaolin Master, a Kung Fu game along the lines of that which is very popular in the arcade (the one which involves ducts). Advanced orders of Shaolin Master at the show exceeded sales of 6809 Express and both will be reviewed soon. The Disk version of Shaolin Master (Dragon-Dos only ... Oh ... ) will include speech.

Quickbeam were quick to point out that they are open to any new software being written by Dragon programmers and offer a 25 per cent royalty scheme across the board.

## Wintersoft

Wintersoft had found this show much better than the last in terms of sales, a fact which, they felt, was due to the launch of their new game, Juxta-Position. They say that they will from now on only be present at shows if they have new projects to exhibit. They have no plans at the moment except to continue supporting the Dragon and will be releasing *Unleash of Flame* (the second Part of Juxta-Position) soon. The plot will

take over after the crossing of the Juxta-Position to a land of magic. This adventure will be more along the fantasy line than the sort of *Blades of Gen-X*.

## Compuserve

Compuserve had found the show much quieter than last year but had done about the same amount of business. Their main item was their Dragon Hard Disk system, incorporating 80 column card and 128k expansion which will retail for about a £1,080 (which is actually very, very cheap for the product). The expansion runs with EGA+ and does not need fax, although it is advisable.

The storage of a single hard disk is the equivalent of 20 boxes of disks and this system is also over four times faster! The driver software contains on-board ROM and RAM and may include a hard.

To give some idea of the economic pricing of this unit Compuserve pointed out

that to buy just the hard disk part of the expansion for the BBC would cost at £1,000. The unit, by the time you read this, will be available for both the Dragon II and the 32.

Amongst the many others displaying were *Amstrad*/Compuserve who were showing the excellent Electronic Audio word processor, and were previewing a new game. There were also various companies selling Discs, T-Shirts, Books, etc., at low prices ... there were certainly many bargains to be had.

The general mood of the show then was one of excitement but a rumour reached me that the next show could well be the last. This, I feel, would be a great shame as the 6809 show is one of the things that has helped to keep the Dragon alive.

If Dragon owners wish to ensure a prosperous future for their machine it is up to them to attend the shows that provide the life blood for the machine. Pull on the next one!

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"Linkword seems to be an excellent program, with much enjoyment to be had from it ..." — *Dragon User, May '85*

# Taking the tablets

Renaissance man **Mike Gerrard** takes some time off from adventuring to try out the Touchmaster Touch Tablet

**MOST PEOPLE** will know Touchmaster as the name of the company that rose out of Dragon Data's ashes with the intention of providing software and support for our dearly beloved computer, and Touchmaster is also the name of the Touch Tablet now available for the Dragon as well as several other micros. But don't just take a quick look at the incredibly detailed and colourful graphics used in the magazine ads to illustrate what can be done with a Touch Tablet, as results like that are not achieved without hours of painstaking effort.

A Touch Tablet is simply a pressure sensitive pad which attaches to the computer, and on making contact with this with the appropriate pen/stylus the results can be seen on screen and also normally saved to disk or tape, thereby allowing non-programmers (and even programmers) to produce the graphics they want without resorting to a long list of the computer's own BASIC graphics commands. Most Touch Tablets have a feedback mode, allowing you to scribble on screen to your heart's content, while along top, bottom or side of the actual drawing screen on the tablet will run a list of the commands and colours available, each of these again accessed by a touch of the pen.

Touchmaster itself comes well packed in the trusty styrofoam box, and as well as the pad you get a stylus, interface, transformer, pad overlay, Multipoint cassette and appropriate manuals, if you can call eight or 12 pages a manual. The transformer is suitably bigger than a regular three-pin plug, and with the interface plugged into the pad and the Dragon's cartridge port, you're away. The interface is made up of a lengthy enough three foot ribbon cable, and the connection also has an expansion bus duplicating the cartridge slot, which has been slightly modified to work with both Dragon and Premier drives connected.

The stylus is simply a plastic pen with a rounded end, though in fact pressure can be applied with almost anything that won't damage the pad or any overlays being used. Better stick to the stylus while changing commands, and I used the top of a ball-point pen for this ... using the writing end might have had rather disastrous results.

Documentation is one of the package's

downfalls, as the Touchmaster User Guide is a small 12-page booklet covering all machines, and apart from connecting up and a few lines on taking care of the hardware, all you get is one simple program which prints the co-ordinates on screen when you touch the pad with the stylus.

The User Guide for the Multipoint software provided is better, but still leaves room for improvement. The opening page, for example, tells you that "Your masterpieces can then be saved on tape or disk to be incorporated into your own programs later". Unfortunately it doesn't go on to explain how to do this, and as each of your masterpieces is stored in a machine code program, the average BASIC programmer will be at a loss as to how to incorporate these. Instructions about the various commands such as LINE and SQUARE are also minimal — the kind of instructions where, once you've experimented for yourself to get the hang of things, you then understand what they were trying to tell you.

To use Multipoint you'll need your Dragon manual by your side, unless you know by heart the various MODEs and colour sets available. You firstly select the MODEs you wish to work in by pressing the MODEs box followed by a number from zero to four, trying not to be put off by the weird things that happen to the screen while you do so, though if you want really weird results try working in the allegedly non-existent MODE 5: Picosas watch out. Next you select a PAGE for the start of the

graphics screen, followed by whichever of the two available colour sets you want for the chosen MODE. After that, you're away.

You can clear the screen to whichever background colour you want, and then work in the other available colour(s) ... well, you can draw in the background colour if you wish, but don't ask me to peel at the results. Colours used strictly match the colour numbers on the Dragon, and beneath the box containing the nine colours/numbers, and the one for MODE PAGE/Colour Set, is one offering nine types of brush strokes. These are a simple point, a circle, square or rectangle, and a choice of lines at five different angles. The width of these can be adjusted by pressing a number box, then the colour you want to work in. Using the same box for colours and numbers can be a little confusing, as your first press can result in two successive "clicks" registering, meaning you'd be working in the colour that happens to be the same number as your brush width, and you have to resort to the COLOUR box to withdraw the commands and start again.

In addition to feedback you can also produce various set shapes, these being a line, triangle, rectangle, circle, ellipse, parallelogram and polygon. They can be any size, and are easily obtained by setting one or two cursor points on the screen, then moving the stylus point around the screen till you see the exact result that you want. Any command can be taken back using COOPS, and nothing is set in the picture till you confirm it with ENTER, the FILL command will put any available col-





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car inside any continuous border, and this has two drawbacks. One is that in the hand mode the pen has to be pressed very firmly along the design to obtain a continuous line, and so it is quite easy for the occasional pixel not to register, which you can't easily spot on the screen... until you try to fill the shape and the colour bleeds out to go looking for another border of the appropriate colour. This usually results in the whole screen being filled. OOPS! The second drawback is that you can't FILL a shape which has borders of contrasting colours, but that's not exactly a disaster and you can get round it with a little effort.

Other commands not yet covered are boxes for SAVE and LOAD, TAPES and DISK, all these being well prompted, while the CLS to clear the screen is guarded with an option for you to OOPS or QD on to choose the colour of the new screen.

So far so good, or reasonably so, but Touchmaster does have problems, mainly to do with the actual sensitivity of the pad. As mentioned before, pressure on the stylus has to be pretty firm, and this does inhibit the freehand drawing somewhat. The other occasional problem I had was in the program hanging up on me. Sometimes in the hand mode, wishing to capture the latest bit of artistic endeavour for posterity, there would be no 'click' when I tried to press ENTER. In fact I couldn't OOPS, CLS, SAVE or anything. Occasionally the reset button returned me to the program, with part of the masterpiece preserved in memory, though sometimes it required a re-LOAD of the Multitape program.

These are irritations, but as long as you SAVE your work in progress regularly, and don't mind having to make several attempts to get the results you want, Touchmaster can produce very effective graphics, the best I found being the impressionistic freehand efforts, though you will have to lay in a goodly supply of graph paper of some kind for the best pre-planned results. It's expensive and its faults annoyed me, but I must admit that after a few hours I was becoming very pleased with the graphics appearing on

screen.

Of course you don't need to use Multitape with Touchmaster, because Touchmaster Ltd has produced a range of software that makes use of the Touch Tablet's facilities, some ten of their titles being available for the Dragon. Our review copies have been mainly educational titles, which are no doubt, putting the tablet to its best use, but you can also get *Ohello*, *Draughts*, a graphics adventure called *Penibus* (Corder and Rennie's strategy game, *Strategic Command* — Romik is the software house behind Touchmaster, incidentally, and this is suitably reflected in the initial software available).

*Strategic Command* seemed to gain little by being linked up to a Touch Tablet, particularly as the software is packaged in large plastic tubes. This is one way of dealing with the 11" x 8" overlays needed, but when unpacked they become almost impossible to lay flat on the tablet unless you've got a handy steamroller to press on top of them for a few days. I certainly wouldn't buy Touchmaster just to play games on, as this is more of a novelty use than a practical one, and I was much happier playing the boring old un-

#### Touchmaster's Strategic Command

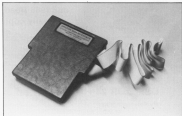
Where this package does come into its own, though, is in its use for young children who aren't yet ready to cope with a confusing keyboard. There are five educational packages, designed to test observation, memory, shapes and colours. *Simon Says* is initially a build-a-face game, from a selection of eyes, noses, ears etc, and then the child can choose to have various features on the face change, any number between one and eight, and he or she must remember the sequence. *Re-ward* is an amusing animation of feeding a cat.

*Simon Saw* shows you a completed picture on the screen, of eight, 12 or 16 shapes according to the level selected, and when this is broken up the child must recreate the picture a shape at a time by matching on the overlay the shape that is flashing on the screen. Graphics on this are very nicely done, and it's a game both appealing and educational. *Simon's Shapes* presents an overlay showing eight different shapes and six colours. On the first level the child must simply match a shape on screen with one on the overlay, and on the second level both shape and colour must be matched. Third level is back to matching shapes, but this time in order to construct a picture.

*Simon's Squares* and *Simply Simon* roughly follow along in the same vein — I would say all of the programs are definitely of some educational value.

So what about the system as a whole? At the original price of £149.95, the Touch Tablet was an expensive piece of equipment — certainly not an impulse buy. But at the present price of £52.95 (including five programs) comes into the casual buying price range for someone looking for new avenues to explore on their Dragon. Recommended.

**Hardware:** Touchmaster Touch Tablet. **Price:** £49.95 plus £3.00 postage and packing (mail order only). **Supplier:** Touchmaster Ltd, Unit 8, Dragon Industrial Park, Baglan, Port Talbot, West Glamorgan, SA12 7DU. Tel: Brian Perry 620215.



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# The Third Dimension

An introduction to three-dimensional graphics

by Peter Whittaker

In THIS article on two dimensional graphics (Dragon user December 1985) we discovered that the DRAW command, in favour of a co-ordinate based system using the LOC command to join the various points together. To extend this technique into the third dimension is really quite simple. First we must modify our matrices to handle the extra dimension, and then we must derive an equation to translate the three dimensional co-ordinates into two dimensional points on the screen. We'll deal with the matrices used for manipulating an object in three dimensions first, and then give you a method of calculating the translation to screen display.

Table One shows how to calculate an object's new position after being transformed by a matrix. The co-ordinate system (X,Y,Z) is multiplied by each column of the transformation matrix. The total from each column of multiplications will be the new co-ordinate value. Table Two gives all the basic matrices we will need to move objects through three dimensions.

Listing One uses the derived equations to rotate a pyramid about its centre. Because the program first counts the number of co-ordinates in the object, we can change the data statements, and the program will happily move tanks, cars, planes, or any other object around the screen. Insert a "PROM" in Lines 328, and 340, and the program will change the pyramid for a tank. "PROM" Lines 368, and 370 and the program will rotate a plane. If you insert your own data lines, they must be terminated with a 999 to indicate that the last co-ordinate has been read.

## Matrices

As with the matrices used for two dimensional graphics, two or more matrices can be multiplied together to give more complicated movements. It is very important to make sure that the matrices are multiplied together in the correct order, because if they are not then they will produce a different net movement than that which is desired. Each row of the first matrix must be multiplied by each column of the second matrix. (see Table Three). Listing Three is a program for multiplying matrices together. When the values are entered for two separate matrices, the program will print out the values for the new combined matrix. Table Four shows how two rotation matrices can be multiplied together, and the resulting equations can be inserted into the program. Change Lines 320-348 to XT=X\*CC+Y\*SS+SS\*SS+Z\*CC+SS, YT=Y\*CC+Z\*SS-SS\*SS+Z\*CC+SS, ZT=Z\*SS+Y\*SS+CC\*Z\*CC\*CC and the program will now rotate about both

the X-axis and the Y-axis together. However these three dimensional matrices are based around the origin (0,0,0). If we move the pyramid away from the origin (put a "PROM" in Line 320, and use the DATA from Line 340), then it will rotate in orbit about the origin and not about its own centre. If we wanted it to still spin about its own centre, we would first have to move it back to the origin, then rotate it, and then move it back out again. Change Lines 320-340 to XT=X, YT=Y, ZT=Z\*CC+Y\*SS+CC\*Z\*CC\*CC-SS\*SS+Z\*CC+SS, ZT=Z\*SS+Y\*SS+CC\*Z\*CC\*CC-SS\*SS+Z\*CC+SS. This will now rotate the pyramid about its own centre, without it orbiting the origin.

## 3-D Movement

Now that we can successfully move objects around in three dimensions, we need to be able to convert the objects position into flat screen co-ordinates, without losing the depth perspective of the three dimensional object. To simplify calculations, I have located our viewpoint on the Z-axis, looking directly towards the origin. If we wanted to view the object from a higher point, this would be done by keeping the eye in the same place, and moving the object down. Similarly, we can appear to

orbit around the object by rotating it in the opposite direction. Fig Four shows how by remaining on the Z-axis, we can then calculate the screen position of a point, from its known three dimensional location.

In the diagram, X1 represents the X-displacement of the object from the Z-axis. If we draw a line from this point to the eye, the point X2 will represent the point on the screen which will appear identical to the point X1. We have set the distance from the origin to the screen at 40 units, and so the distance of X1 from the screen will be 40+Z1. If we call the distance between the screen and the eye "D" then we can derive the relationship:  $X_2(D) = X_1(D+Z1+40)$ . Rearranging this equation, we get  $X_2 = X_1 * D / (D+Z1+40)$ . Finally, to get some control over the size of the drawing, we include a scaling factor, and often the origin to the centre of the screen, before drawing the picture to the screen.  $X_3 = 128 + S * X_2 + D * (D+Z1+40)$ . Similar calculations lead to the equation  $Y_3 = 81 - S * Y_1 * D / (D+Z1+40)$  for the Y co-ordinates. Try experimenting with the values of D, S, and the distance of the screen from the origin (40), to see the effect this has upon the illusion of depth.

Although the program works well, it is quite slow. The pyramid moves slowly, the plane moves slower, and the tank moves

$$\begin{pmatrix} X1 \\ Y1 \\ Z1 \end{pmatrix} = \begin{pmatrix} X \\ Y \\ Z \end{pmatrix} * \begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix}$$

$$X2 = \begin{pmatrix} X \\ Y \\ Z \end{pmatrix} * \begin{pmatrix} a & . & . \\ b & . & . \\ c & . & . \\ d & . & . \end{pmatrix} = Xa + Yb + Zc + d$$

$$Y2 = \begin{pmatrix} X \\ Y \\ Z \end{pmatrix} * \begin{pmatrix} . & a & . \\ . & b & . \\ . & c & . \\ . & d & . \end{pmatrix} = Xb + Yc + Zd + b$$

$$Z2 = \begin{pmatrix} X \\ Y \\ Z \end{pmatrix} * \begin{pmatrix} . & . & a \\ . & . & b \\ . & . & c \\ . & . & d \end{pmatrix} = Xc + Yd + Zk + c$$

Table 1 - Matrix Multiplication

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even slower still. This is because of the increasing amount of number crunching required as the number of co-ordinates required to draw the object increases. It is not possible to speed up the program without resorting to machine code. However, by turning to "off-line animation" we can make the object move much faster. Using Two will spin a tank around the screen, giving perspective views from before and above as it wanders over the screen. Insert a "REM" in Lines 610 and 620 to change the tank for a plane.) When RUN, the program will display an option list and wait for a keypress. Press <G> and then go and have a cup of coffee whilst the program number crunches for five to ten minutes.

The program will calculate all the screen co-ordinates needed to draw the moving object, and then save them to the protected memory above address 200000. If the program does not crash due to the object moving out of range of the screen display, the program will return to the menu screen once the memory reserved for data has been filled. In either case, the data can now be saved to tape by pressing <S>, or run by pressing <R>.

When the <R> option is selected, the program will display the tank spinning around the screen. Each tank is drawn on graphics pages five to eight, and once completed is copied to the display screen. Because the program reads the screen

co-ordinates from memory, and has very little number crunching to do, the tank will move quickly, with hardly a pause between each successive picture.

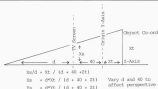
If the <S> option is selected, the data is saved along with a count of the number of co-ordinates in the object. When reloaded <L> this count enables the program to run data from any object with any number of co-ordinates, without having to enter the number of co-ordinates separately.

Unlike Listing One which used an updated array system to carry the co-ordinate data, Listing Two reads the data from data statements. This reduces the complexity of the matrices required to manipulate the objects. Instead, the matrix values are constantly updated, and the co-ordinates recalculated.

## Perspective

Finally, there is a third approach we can adopt in the study of three dimensional graphics. Instead of moving tanks and jets around the screen, we can generate symmetrical objects such as wine glasses, by rotating a shaped line through 360 degrees. RUN Listing Four and the computer will generate a perspective view of a wine glass. When prompted for rotation angles, enter values between minus three and plus three. The program works by reading the line co-ordinates into an array. These are then rotated through 360 degrees around the Y-axis, in 20 steps. The program keeps track of the current line, and the last line, in the arrays "OLDX" 1-31" and "ROTATEDX" 1-31". The three dimensional co-ordinates of the new line are used to calculate the screen co-ordinates for the perspective view, which are stored at ROTATEDY 1-443. The program then joins each of the OLDY-1 and ROTATEDY-1 co-ordinate pairs with a line, and draws the new ROTATED line. Then the ROTATEDY-1 data is transferred to the OLDY-1 array, and the next line is calculated.

It is possible to change the perspective calculations to include scaling or to put a loop into the program to spin the glass about the X-axis or the Z-axis. Any such alterations must be made to the perspective calculations only (Lines 418-455). The rotation calculations (Lines 468-588) must not be changed, or the glass shape will be destroyed. The object shape can be changed by altering the data statements in Line 620. As with all the programs, this data statement must be terminated by a 999 to indicate the end of the co-ordinate data. The only problem we are left with, is the "hidden Cube" type of illusion. There are times when it is not possible to tell whether the glass is pointing towards us, or away from us. Although there are some visual clues from the relative sizes of the near and distant parts of the glass, the eyes are often fooled. This is a problem common to all symmetrical wire frame models, and can only be solved by the use of "hidden line removal" techniques. These I leave for you to work on.



$$Xa/d = X1 / (d1 + 40 + 21)$$

$$Ya = dPY / (d1 + 40 + 21)$$

$$Za = dPY / (d1 + 40 + 21)$$

Varry d and 40 to effect perspective

Table 1 - Multiplication using two columns

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# LISTING #1. 3D ROTATION.

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10 POKES495.8:"SPEED UP POKES"
20 PCLERRS=PRODS(1):PCLB=SCREEN(1.8):
  PRODS4.5
30 G=2000:"DISTANCE FROM SCREEN T
  O EYE"
40 THETA=1:"ROTATION STEPS"
50 SS=SIN(THETA):COS=COS(THETA)
60 TX=8:TY=8:TZ=8
70 NUM=0:RESTORE
80 READ A:IF A<999 THEN NUM=NUM+1:
  GOT080
90 NUM=NUM-3-1:"RECALCULATE NUMBER
  OF CO-ORDINATES"
100 DIM COORDS(4,NUM,3)
110 RESTORE
120 FOR A=0 TO NUM:FOR B=1 TO 3:REA
  D COORDS(A,B):NEXT B:A
130 "***** LOOP *****"
140 A=0:Y=COORDS(A,1):Y=COORDS(A,2):
  Z=COORDS(A,3):GOSUB220
150 PCLB=LINE(XS,YB)-(XS,YS):PSET
160 FOR A=1 TO NUM:Y=COORDS(A,1):Y=
  COORDS(A,2):Z=COORDS(A,3):GOSUB
  220
170 LINE=(XS,YS):PSET:NEXT A
180 LINE(8,91)=(255,91):PSET:LINE(1
  25,91)=(125,191):PSET
190 FOR A=1 TO 4:PCOPY A+4 TO A:NEXT
  A
200 GOT0140
210 "*****HYPERLUT DONE*****"
220 XT=X
230 YT=Y:CC=2555+TY:CC=TZ:SS=TY
240 TZ=Y:SS=2555+TY:SS=TZ:CC=TZ
250 COORDS(A,1)=XT:COORDS(A,2)=YT:CO
  ORDS(A,3)=TZ
260 "*****PERSPECTIVES*****"
270 B=2:"*****SCALE OF DRAWING*****"
280 XS=EXTEND(A:TZ+40+0)+125
290 YS=EXTEND(A:TZ+40+0)+91
300 RETURN
310 "**** PYRAMID DATA ****"
320 DATA -10,-10,-10,-10,-10,10,10,
  -10,10,10,-10,-10,-10,0,0
  -10,0,-10,-10,10,10,-10,-10,0,20
  0,-10,-10,10,999
330 "**** SDCSC P-PRIMID *****"
340 DATA 10,10,10,10,10,30,30,10,30
  30,10,10,10,10,20,20,40,30,
  10,30,10,10,30,20,20,40,30,10,1
  0,999
350 "**** TRNG DATA ****"
360 DATA -10,-10,-5,10,-10,-5,10,-1
  0,5,-10,-10,5,-10,-10,-5,-7,0,-
  3,7,0,-3,10,-10,-5,7,0,-3,7,0,3
  -10,-10,5,7,0,3,-7,0,3,-10,-10,
  5,-7,0,3,-7,0,-3
370 DATA -3,0,-3,-3,10,-3,-3,10,3,-
  3,0,3,-3,10,3,5,0,10,5,0,10,3

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```

,0,3,0,0,3,0,0,3,0,0,-3,10,-3,0
20
380 "**** GET DATA ****"
390 DATA 40,0,0,5,-5,0,-50,0,0,10,5
  ,10,-40,0,0,10,5,-10,-10,5,10,10,
  5,-10,-50,0,0,-50,5,-15,-45,0,0
  ,-50,0,15,-50,0,0,-50,15,0,-45,
  0,0
400 DATA 10,0,0,-10,10,50,-0,0,0,-1
  0,10,-50,10,0,0,999
410 "C) 1985 PETER HOTTACKER.
```

# LISTING #2. OFFLINE ANIMATION

```

10 POKES495.8:"SPEED UP POKE"
20 CLRASC(0,20000):PCLERRS=20000
  1
30 "*****OPTION SELECTION*****"
40 CLS:PRINT#10,"3D DATA DRAW" FROM
  T:PRINT
50 PRINT"GENERATE DATA (G)"
60 PRINT"RUN DATA (R)"
70 PRINT"SAVE DATA (S)"
80 PRINT"LOAD DATA (L)"
90 AS=INKEY$:IF AS="" THEN 90
100 IF AS="G" THEN 100
110 IF AS="R" THEN 300
120 IF AS="S" THEN 510
130 IF AS="L" THEN 590
140 GOT030
150 "RECALCULATE NUMBER OF POINTS*****"
160 RESTORE:NUM=0
170 READ A:IF A<999 THEN NUM=NUM+1:
  GOT0170
180 NUM=NUM-3-1
190 FOR B=1 TO NUM:"SAVE NUM IN COO
  D *****"
200 "RECALCULATE CO-ORDINATES*****"
210 G=100:B=2:"DISTANCE OF EYE FROM
  SCREEN, AND SCALING FACTOR FOR
  DISPLAY."
220 TX=8:TY=8:TZ=8
230 THETA=THETA+1:"ROTATION STEP"
240 IF TY=49 THEN VERTICAL=1:ELSE I
  F TY<30 THEN VERTICAL=1
250 TY=TY+VERTICAL
260 RESTORE
270 READ X,Y,Z:GOSUB490
280 POKEBTE,XS:POKEBTE+1,YB:BYTE=
  BYTE+2
290 FOR A=1 TO NUM:READ X,Y,Z
300 GOSUB490
310 POKE BTE,XS:POKEBTE+1,YB:BYTE=
  BYTE+2
320 PRINT#10:"IF BYTE=32400 THEN GO
  TO40
330 NEXT A
340 GOT0230

```

[illegible][illegible][illegible]

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## DRAGON DRAW

This superb lightpen-driven drawing program allows the OMACOPY's in-line graphics commands to be used directly from the on-screen image shown here. There are a wealth of commands available and the lightpen response is superbly instantaneous.

- 4 per acre
- Continuous, adjustable spacing
- Shape linked brush
- 2 drawing screens
- Recycled empty bottle
- Polypropylene
- Freephare plastic
- Solid and shaded fill
- Porous/Plastic clump
- Nests and L-nest
- Get work but from different sources

FILE	GRAPH	FORM	PAINT	COLOR
		Page		
		Word		
		Table		
		Setting		
BLOCK	CLS	EXIT	HOME	SCREEN



**SPECIAL OFFER:**  
**DATAPEN LIGHTPEN and**  
**DRAGON-DRAW Software**  
only £29.95

**FIG. 1.31.** Illustration for Example 1.3.1. The figure shows a rectangular domain with a grid of points. The points are labeled with their coordinates (x, y). The domain is divided into four quadrants by the x and y axes. The points are distributed as follows:

Quadrant	Points (x, y)
First Quadrant (x > 0, y > 0)	(1, 1), (2, 1), (3, 1), (4, 1), (5, 1), (6, 1), (7, 1), (8, 1), (9, 1), (10, 1), (1, 2), (2, 2), (3, 2), (4, 2), (5, 2), (6, 2), (7, 2), (8, 2), (9, 2), (10, 2), (1, 3), (2, 3), (3, 3), (4, 3), (5, 3), (6, 3), (7, 3), (8, 3), (9, 3), (10, 3), (1, 4), (2, 4), (3, 4), (4, 4), (5, 4), (6, 4), (7, 4), (8, 4), (9, 4), (10, 4), (1, 5), (2, 5), (3, 5), (4, 5), (5, 5), (6, 5), (7, 5), (8, 5), (9, 5), (10, 5), (1, 6), (2, 6), (3, 6), (4, 6), (5, 6), (6, 6), (7, 6), (8, 6), (9, 6), (10, 6), (1, 7), (2, 7), (3, 7), (4, 7), (5, 7), (6, 7), (7, 7), (8, 7), (9, 7), (10, 7), (1, 8), (2, 8), (3, 8), (4, 8), (5, 8), (6, 8), (7, 8), (8, 8), (9, 8), (10, 8), (1, 9), (2, 9), (3, 9), (4, 9), (5, 9), (6, 9), (7, 9), (8, 9), (9, 9), (10, 9), (1, 10), (2, 10), (3, 10), (4, 10), (5, 10), (6, 10), (7, 10), (8, 10), (9, 10), (10, 10)
Second Quadrant (x < 0, y > 0)	(-1, 1), (-2, 1), (-3, 1), (-4, 1), (-5, 1), (-6, 1), (-7, 1), (-8, 1), (-9, 1), (-10, 1), (-1, 2), (-2, 2), (-3, 2), (-4, 2), (-5, 2), (-6, 2), (-7, 2), (-8, 2), (-9, 2), (-10, 2), (-1, 3), (-2, 3), (-3, 3), (-4, 3), (-5, 3), (-6, 3), (-7, 3), (-8, 3), (-9, 3), (-10, 3), (-1, 4), (-2, 4), (-3, 4), (-4, 4), (-5, 4), (-6, 4), (-7, 4), (-8, 4), (-9, 4), (-10, 4), (-1, 5), (-2, 5), (-3, 5), (-4, 5), (-5, 5), (-6, 5), (-7, 5), (-8, 5), (-9, 5), (-10, 5), (-1, 6), (-2, 6), (-3, 6), (-4, 6), (-5, 6), (-6, 6), (-7, 6), (-8, 6), (-9, 6), (-10, 6), (-1, 7), (-2, 7), (-3, 7), (-4, 7), (-5, 7), (-6, 7), (-7, 7), (-8, 7), (-9, 7), (-10, 7), (-1, 8), (-2, 8), (-3, 8), (-4, 8), (-5, 8), (-6, 8), (-7, 8), (-8, 8), (-9, 8), (-10, 8), (-1, 9), (-2, 9), (-3, 9), (-4, 9), (-5, 9), (-6, 9), (-7, 9), (-8, 9), (-9, 9), (-10, 9), (-1, 10), (-2, 10), (-3, 10), (-4, 10), (-5, 10), (-6, 10), (-7, 10), (-8, 10), (-9, 10), (-10, 10)
Third Quadrant (x < 0, y < 0)	(-1, -1), (-2, -1), (-3, -1), (-4, -1), (-5, -1), (-6, -1), (-7, -1), (-8, -1), (-9, -1), (-10, -1), (-1, -2), (-2, -2), (-3, -2), (-4, -2), (-5, -2), (-6, -2), (-7, -2), (-8, -2), (-9, -2), (-10, -2), (-1, -3), (-2, -3), (-3, -3), (-4, -3), (-5, -3), (-6, -3), (-7, -3), (-8, -3), (-9, -3), (-10, -3), (-1, -4), (-2, -4), (-3, -4), (-4, -4), (-5, -4), (-6, -4), (-7, -4), (-8, -4), (-9, -4), (-10, -4), (-1, -5), (-2, -5), (-3, -5), (-4, -5), (-5, -5), (-6, -5), (-7, -5), (-8, -5), (-9, -5), (-10, -5), (-1, -6), (-2, -6), (-3, -6), (-4, -6), (-5, -6), (-6, -6), (-7, -6), (-8, -6), (-9, -6), (-10, -6), (-1, -7), (-2, -7), (-3, -7), (-4, -7), (-5, -7), (-6, -7), (-7, -7), (-8, -7), (-9, -7), (-10, -7), (-1, -8), (-2, -8), (-3, -8), (-4, -8), (-5, -8), (-6, -8), (-7, -8), (-8, -8), (-9, -8), (-10, -8), (-1, -9), (-2, -9), (-3, -9), (-4, -9), (-5, -9), (-6, -9), (-7, -9), (-8, -9), (-9, -9), (-10, -9), (-1, -10), (-2, -10), (-3, -10), (-4, -10), (-5, -10), (-6, -10), (-7, -10), (-8, -10), (-9, -10), (-10, -10)
Fourth Quadrant (x > 0, y < 0)	(1, -1), (2, -1), (3, -1), (4, -1), (5, -1), (6, -1), (7, -1), (8, -1), (9, -1), (10, -1), (1, -2), (2, -2), (3, -2), (4, -2), (5, -2), (6, -2), (7, -2), (8, -2), (9, -2), (10, -2), (1, -3), (2, -3), (3, -3), (4, -3), (5, -3), (6, -3), (7, -3), (8, -3), (9, -3), (10, -3), (1, -4), (2, -4), (3, -4), (4, -4), (5, -4), (6, -4), (7, -4), (8, -4), (9, -4), (10, -4), (1, -5), (2, -5), (3, -5), (4, -5), (5, -5), (6, -5), (7, -5), (8, -5), (9, -5), (10, -5), (1, -6), (2, -6), (3, -6), (4, -6), (5, -6), (6, -6), (7, -6), (8, -6), (9, -6), (10, -6), (1, -7), (2, -7), (3, -7), (4, -7), (5, -7), (6, -7), (7, -7), (8, -7), (9, -7), (10, -7), (1, -8), (2, -8), (3, -8), (4, -8), (5, -8), (6, -8), (7, -8), (8, -8), (9, -8), (10, -8), (1, -9), (2, -9), (3, -9), (4, -9), (5, -9), (6, -9), (7, -9), (8, -9), (9, -9), (10, -9), (1, -10), (2, -10), (3, -10), (4, -10), (5, -10), (6, -10), (7, -10), (8, -10), (9, -10), (10, -10)

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- PMODE 1 with 4-colour drawing
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  - Combined shape libraries
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# Donkey's Tail

*An old family favourite brought to you by Brian Hinson*

NOW THAT the extremely late summer has been forced to depart and we are all huddled round our computers with our loved ones, I thought it was about time we had a really easy game that everyone can play. (Well anyone who can use a joystick.)

Granted and the toddlers should be able to manage this one. But it will take you a bit of work to get it ready, especially if you want it to be attractive to visitors around for those dark February evenings.

You will need a drawing in PMODE 3 of a donkey, some form of instructions and the main listing. Now there are several ways of achieving this:

- 1) I have provided full listings here that will allow you to set everything up as I have designed it.
- 2) If you have "Artist", as published in Oregon User in April 1985, you will be able to produce your own machine code program from a donkey you draw yourself.
- 3) If you have "Dizzy", as published in Oregon User in October 1985 you can produce your own tile pages.
- 4) You may have another means of producing the donkey and/or tile pages.

From now on I will assume you are using my listing, but will add notes as appropriate for those who are not. When all the listings are completed and recorded on to tape in the right order the following will happen: type CLOAD and the "START" program will load. Type RUN and a few lines of the "Donkey sequence" will play followed by the display of the first tile page whilst the "DONKEY" graphics are loaded. The second tile page will be displayed whilst the main program loads. Type RUN when the "OK" prompt appears.

This will display a Donkey standing in a field of grass. The animal moves to a random position where it is seen for only a moment. You are then given a tail coloured red, yellow or blue, which you move using the right joystick, in where you think the Donkey's bottom is. Press the button and see how close you are! The Donkey re-appears with the new tail. Pass the joystick to the next player and press R for a new tail of the next colour. The blank green screen is displayed with the new tail to be positioned.

When you want the Donkey to find a new place to hide press the *Spacebar*. All screens are cleared and you start all over again with the Donkey appearing in a new random position.

But that's all in the future — for the present let's get down to business. First you

need to type in the "Star" program listing and store it near the beginning of a blank tape.

Next you need an introductory tile page. I offer you Listing 1 which will create and save a machine code program to display basic information on the test screen whilst your donkey graphics load.

Now you will need a Donkey! If you like you can draw your own donkey in the rectangle defined by (0,80) — (114,170). If you are using "ARTIST" load the program as normal but before running it edit the CSARE part to read: 1090 — CSAREM "DONKEY", 1536,7678,1536

RUN and set up the PMODE 3, SCREEN 1,5 with a green background. Before you actually start to draw press BREAK and put in the following direct command: LMO (0,80) — (114,170), POST, BSCREEN 0,0,0,0. You will now be able to see exactly where your Donkey must be drawn. (Face the donkey

to the left.) When ready put the tape in your recorder and proceed with the "SAVE" routine.

Alternatively you can use the Graphics listing to create a machine code program and save it after the first tile page. The program given provides, in Line 210, a means of checking all the programs on the tape so far by including SKIPP. If all is OK the Donkey picture is saved.

Now all that remains is to type in and save the main program. Note that this must be saved with the name "PINTAIL" so that it will be automatically loaded by the START program.

Regrind the tape, plug in the right joystick, type CLOAD and when the "OK" prompt appears type RUN. Sit back and watch the screens change as the programs load. Again type RUN when the "OK" prompt appears and see how close you can get that tail to its correct location. No cheating is allowed and any arguments about where the tail should be will be settled by Muz!

## START .

```
10 CLS0 : GOSUB 400
20 CLOADM "MID"
40 CLEAR$00
50 PCLEAR0
60 DIM H(4000),T1(100),T2(100)
70 G=0
80 PMODE3,1 : PCLS
90 CLOADM "DONKEY"
99 CLOADM "MID2" : GOSUB 400
100 CLOAD "PINTAIL"
400 'MUSIC SUB
410 FOR A=1 TO 8
420 READ A# : PLAY A#
430 NEXT A
440 RETURN
500 DATA T5036FL3GP4,L40GGP4,L40GGP4
510 DATA G4L3C003L4W4G6,G0L70C0EL3GP4
520 DATA G0L30EL3,L430EL3GP4
530 DATA G4L6C00CL80L3000
540 DATA C0L400C0L60EP0
```

[illegible]

```

10 PCLEAR 4 : PPODE3.1
20 PCLS : SCREEN 1.0
30 FOR A=0 TO 436
40 READ B,C
50 POKE B,C
60 NEXT A
70 FOR B=1 TO 20
80 Y=RND(1500)+300
90 X=RND(1500)+1500
100 IF Y<60 THEN X=X-120
110 FOR A=1 TO 3*RND(6)
120 COLOR RND(3)+1,1
130 IF Y<100 THEN Y2=0
140 C=RND(200)+10
150 IF Y>100 AND Y<150 THEN Y2=2
160 IF Y>150 AND Y<180 THEN Y2=4
170 IF Y>180 AND Y<190 THEN Y2=6
180 LINE CX,Y=C+C,C,Y-Y2-30,PFSET
190 NEXT A,B
200 CLS : PRINT"GET YOUR TAPE UP TO <PLAY> WITH YOUR <DONKEY>
TAPE ALREADY          CONTAINING 'M&D' "
210 SLEEP"M&D"
220 CLS2 : PRINT"NOW SET THE RECORDER TO <RECORD>".PRINT"PRESS
4R" WHEN READY"
230 KE=INKEY$: IF KE<>"R" THEN 230
240 GOSUB"DONKEY",1536,7479,1536
250 END

1000 DATA 3714,3,3715,192,3746,3,3747,240,3778,3,3779,112,3810
,3,3811,112,3843,3,3843,112,3874,3,3875,112,3906,15,
3937,112,3938,63,3939,127,3970,255,3971,124,3972,192

1010 DATA 4002,213,4003,95,4004,192,4004,213,4005,67,4006,192,
4007,3,4008,223,4007,67,4008,192,4007,3,4008,95,4009
,213,4009,240,4010,15,4010,95,4011,67,4012,240,4011,
13,4012,67

1020 DATA 4163,67,4164,252,4193,65,4194,65,4195,65,4196,252,42
25,53,4226,65,4227,65,4228,95,4227,243,4228,65,4229,
95,4229,95,4231,192,4229,243,4229,65,4231,65,4232,65
,4233,192

1030 DATA 4320,3,4321,253,4322,65,4323,65,4324,67,4325,192,432
2,15,4323,95,4324,65,4325,243,4326,67,4327,192,4328,
13,4325,95,4326,95,4327,213,4328,67,4329,253,4416,63
,4417,67

1040 DATA 4418,253,4419,65,4420,67,4421,253,4422,243,4448,43,4
449,67,4450,65,4451,65,4452,65,4453,252,4454,65,4455
,63,4451,67,4452,65,4453,65,4454,65,4455,95,4453,65,
4512,15

1050 DATA 4513,67,4514,213,4515,65,4516,65,4517,67,4518,253,45
44,2,4545,65,4546,213,4547,67,4548,213,4549,65,4550,
253,4551,252,4553,3,4554,252,4576,3,4577,253,4578,21
3,4579,65

1060 DATA 4580,213,4581,95,4582,243,4583,95,4584,252,4585,63,4
586,95,4587,192,4588,213,4589,253,4591,65,4592,213,4
593,95,4594,243,4595,65,4596,95,4597,243,4598,65,461
9,240,4640,3

```

1070 DATA 4641,211,4642,255,4643,213,4644,245,4645,95,4646,65,  
4647,85,4648,95,4649,117,4650,85,4651,124,4672,211,4  
674,192,4675,245,4676,125,4677,95,4678,95,4679,85,46  
80,85,4681,117

1080 DATA 4682,85,4683,95,4705,252,4707,61,4709,93,4709,95,471  
0,85,4711,85,4712,85,4713,125,4714,85,4715,87,4716,1  
92,4739,13,4740,95,4741,85,4742,85,4743,85,4744,85,4  
745,93

1090 DATA 4746,85,4747,85,4748,192,4771,15,4772,87,4773,85,477  
4,85,4775,85,4776,85,4777,95,4778,85,4779,85,4780,24  
6,4803,3,4804,87,4805,85,4806,85,4807,85,4808,85,480  
9,87

1100 DATA 4810,85,4811,85,4812,112,4835,3,4836,87,4837,85,4838  
,85,4839,85,4840,85,4841,85,4842,85,4843,85,4844,112  
,4847,3,4848,87,4849,85,4870,85,4871,85,4872,85,4873  
,85

1110 DATA 4874,85,4875,85,4876,92,4899,3,4900,87,4901,85,4902,  
85,4903,85,4904,85,4905,85,4906,85,4907,85,4908,92,4  
931,3,4932,85,4933,85,4934,85,4935,85,4936,85,4937,8  
5

1120 DATA 4938,85,4939,85,4940,92,4963,3,4964,213,4965,85,4966  
,85,4967,85,4968,85,4969,85,4970,85,4971,85,4972,92,  
4994,213,4997,85,4998,85,4999,85,5000,85,5001,85,500  
2,85

1130 DATA 5003,85,5004,95,5025,213,5029,85,5030,85,5031,85,503  
2,85,5033,85,5034,85,5035,85,5036,87,5060,213,5061,8  
5,5062,87,5063,85,5064,85,5065,85,5066,85,5067,85,50  
68,87

1140 DATA 5072,245,5073,85,5094,95,5095,85,5096,85,5097,85,509  
8,85,5099,85,5100,87,5124,245,5125,85,5126,93,5127,8  
5,5128,85,5129,85,5130,85,5131,85,5132,87,5154,63,51  
57,85

1150 DATA 5158,93,5159,85,5160,85,5161,255,5162,85,5163,85,516  
4,87,5180,53,5189,85,5190,93,5191,85,5192,85,5193,85  
,5194,85,5195,85,5196,87,5220,63,5221,85,5222,93,522  
3,85

1160 DATA 5224,95,5225,253,5226,213,5227,85,5228,87,5253,85,52  
53,85,5254,95,5255,213,5256,85,5257,85,5258,213,5259  
,85,5260,87,5264,51,5265,213,5266,125,5267,245,5268,  
127,5269,255

1170 DATA 5270,213,5291,85,5292,87,5316,53,5317,213,5318,127,8  
319,181,5320,85,5321,255,5322,213,5323,85,5324,87,83  
48,13,5347,213,5350,123,5351,189,5352,85,5353,255,53  
54,245,5355,85

1180 DATA 5356,87,5380,13,5381,245,5382,122,5383,173,5384,95,5  
385,192,5386,245,5387,85,5388,87,5412,13,5413,117,54  
14,123,5415,175,5416,255,5417,255,5418,245,5419,85,5  
420,85,5444,3

1190 DATA 5445, 117, 5446, 126, 5447, 171, 5448, 234, 5449, 176, 5450, 26  
5, 5451, 85, 5452, 92, 5476, 3, 5477, 117, 5478, 94, 5479, 176, 5  
480, 234, 5481, 176, 5482, 245, 5483, 85, 5484, 124, 5500, 3, 55  
69, 246, 5510, 94

1200 DATA 5511, 176, 5512, 176, 5513, 176, 5514, 255, 5515, 65, 5516, 112  
, 5541, 53, 5542, 94, 5543, 176, 5544, 176, 5545, 176, 5546, 169  
, 5547, 85, 5548, 112, 5573, 53, 5574, 126, 5575, 176, 5576, 176  
, 5577, 196, 5578, 191

1210 DATA 5579, 210, 5580, 112, 5605, 83, 5606, 115, 5607, 235, 5608, 351  
, 5609, 255, 5610, 191, 5611, 243, 5612, 192, 5637, 53, 5638, 11  
5, 5639, 255, 5640, 63, 5641, 3, 5642, 176, 5643, 213, 5644, 112  
, 5645, 53, 5676, 112

1220 DATA 5673, 3, 5674, 234, 5675, 245, 5676, 112, 5701, 53, 5702, 127, 5  
704, 255, 5707, 245, 5708, 124, 5733, 61, 5734, 95, 5735, 235, 5  
739, 245, 5746, 92, 5748, 13, 5749, 95, 5770, 43, 5771, 246, 577  
2, 92, 5797, 13

1230 DATA 5798, 92, 5802, 16, 5803, 245, 5804, 92, 5827, 13, 5830, 95, 583  
4, 16, 5835, 255, 5836, 92, 5861, 13, 5862, 87, 5864, 17, 5867, 2  
53, 5868, 92, 5893, 15, 5894, 215, 5895, 3, 5899, 61, 5900, 95, 5  
926, 215

1240 DATA 5931, 255, 5932, 87, 5933, 215, 5963, 255, 5964, 87, 5990, 215,  
5992, 255, 5996, 87, 6022, 215, 6027, 63, 6028, 87, 6054, 215, 6  
059, 63, 6060, 87, 6061, 192, 6086, 215, 6091, 63, 6092, 63, 609  
3, 206, 6118, 215

1250 DATA 6119, 192, 6123, 15, 6134, 213, 6135, 112, 6150, 215, 6151, 192  
, 6155, 15, 6156, 213, 6157, 112, 6182, 223, 6183, 192, 6187, 15  
, 6188, 213, 6189, 112, 6213, 3, 6214, 223, 6215, 192, 6217, 15,  
6220, 213, 6221, 112

1260 DATA 6245, 3, 6246, 95, 6247, 192, 6261, 13, 6282, 213, 6283, 112, 62  
77, 3, 6278, 95, 6283, 15, 6294, 247, 6295, 246, 6307, 3, 6310, 1  
27, 6313, 3, 6316, 247, 6317, 192, 6341, 3, 6342, 127, 6347, 3, 6  
348, 247

1270 DATA 6349, 192, 6373, 3, 6374, 127, 6375, 3, 6380, 247, 6381, 192, 64  
95, 15, 6496, 127, 6411, 3, 6412, 247, 6413, 192, 6437, 13, 6438  
, 127, 6443, 3, 6444, 247, 6445, 192, 6449, 13, 6470, 112, 6475,  
15, 6476, 247

1280 DATA 6477, 192, 6501, 13, 6502, 112, 6507, 15, 6508, 247, 6509, 192,  
6533, 13, 6534, 112, 6535, 63, 6540, 53, 6541, 192, 6545, 61, 65  
46, 246, 6571, 63, 6572, 246, 6573, 192, 6597, 53, 6598, 192, 66  
03, 60, 6604, 245

1290 DATA 6605, 192, 6629, 255, 6630, 192, 6632, 15, 6633, 255, 6634, 207  
, 6635, 255, 6636, 213, 6637, 192, 6661, 255, 6662, 192, 6664, 3  
, 6668, 215, 6669, 192, 6672, 3, 6693, 255, 6694, 192, 6695, 3, 6  
696, 255, 6697, 255

1300 DATA 6698, 195, 6699, 246, 6700, 215, 6734, 3, 6735, 255, 6736, 192,  
6731, 3, 6732, 223, 6734, 3, 6735, 255, 6736, 255, 6757, 255, 67  
58, 255, 6759, 195, 6760, 255, 6761, 255, 6762, 246, 6763, 255,  
6764, 255, 6765, 255

1310 DATA 6766, 3, 6796, 252, 6819, 3, 6830, 255, 6831, 255, 6832, 255, 68  
23, 207, 6824, 255, 6825, 255, 6826, 255, 6827, 255, 6828, 255,  
6829, 255, 6830, 246, 6837, 15, 6840, 255, 6861, 255, 6862, 255

Graphics Listing = none









## Printer Poser

Could you please tell me what the pins on the Dragon's printer port are, and how to access them.

*Paul Mearns  
3 Chatterbox St  
Bosworth  
Birmingham  
B7 5LR*

This is another question which seems to crop up more regularly than others. The pin connections to the printer port are given in the additional information booklet or appendix. They are as follows:

Pin 1 — Strobe, Pins 2,3,7, 9,11,13,15,17 — Data bit 0-7, Pin 18—ACK, Pin 20—Busy, Pins 2,4—16, other pins—0 volts.

Three respective I/O locations are: SPT20 bit 1—strobe, SPT20—Data Output, SPT22 bit 0—Busy input. ACK is an interrupt input, see 88 March '85 for details.

## Cyclic Crash

I have two very full disks which together comprise a single adventure game. I have written for the Dragon 32 — a total programme of some 308 K. I operate on a single disk drive system, and have tried to take back-up copies. Unfortunately, I get a cyclic redundancy (CRC) error on the destination disk. In calling up DIR, the destination disk does seem to have all the programmes on it, and then shows the same number of bytes free.

If I then try to run a programme from the destination disk, I get a wrong file mode (FMS) error.

Are you able to tell me what on earth is going on — and in particular can you explain the cyclic redundancy error to me.

*R J Sargeant  
High Green  
May Grove  
Bosworth  
Leicestershire*

The Dragonides manual is a little vague in say the least where error messages are concerned. A 'C' error stands for 'Cyclic Redundancy' error — more commonly known as CRC. Basically, CRC's are a sophisticated ver-



sion of checksums, which are polynomials to produce a unique number which is appended to the end of each sector written. When the data is read back from the sector, the CRC is recalculated and compared to that stored on the sector. If they are different then the data has been corrupted.

I'm afraid that this is what has happened to your disk, the corrupted data also causes the 'FM' error. The DIR command will still show files intact as the directory track has not been affected and DIR only looks at that.

If your files are mainly Basic, you may well be able to recover most of them by using one of the Disk Doctor programs available, several of which have been reviewed in Dragon 88.

## Blinking Cursor

I have a Dragon 32 and the blinking cursor is driving me mad! How can I make it still — and possibly even change its shape?

*M Macdonald  
27 Pyramid Hill  
Liverpool  
L13 7DR*

It is relatively simple to stop the cursor blinking, but rather more complicated to change the character used as the cursor, although it can be done.

The start machine code routine listed below can be used to provide a steady block cursor, once run the cursor will remain steady until the machine is turned off.

```
10 CLEAR 288-32768
20 FOR I = 32768 TO 32768:
  REPEAT A=PRG 1 A=NEXT
30 GETA 15,111,136,137,134,
  135,167,255,6,136,37
40 PRG 362-125-PRG 363,
  127-PRG 364,239
```

## Video Video

I wish to connect my Dragon 32 to a 7 pin Cin RGB socket on my television via the 9-pin Cin monitor socket at the back of my Dragon. I will have to join them myself. Could you please show me which pins to connect between these two as I have no idea.

*Colin J Gell  
408 Cluny Place  
Gloucester  
GL1 4YA*

This is one of many letters regarding connection of RGB monitors to the Dragon. It has been answered before but due to the number of enquiries it is worth repeating.

The Dragon monitor socket has only three connections, pin 1 is sound, pin 2 is ground, and pin 3 is video. The video output is composite video and can only be used with composite video monitors, there is no way of connecting a Dragon to an RGB monitor either from the socket, or even direct from the video chip, as this only outputs composite video.

The confusion all stems from the original Dragon manual which stated that the monitor socket was RGB, which it has never been.

## 32 plus 32 equals?

I would like to link two Dragon 32's together. Finally we communicate between the two machines and secondly to use one as a printer buffer for the other. The obvious solution is to use an

RS232C interface but the circuit I have is limited to 300 baud.

I think the data bus of each machine can be linked directly with the other but do not know if any buffering is necessary can you suggest how I can link the two together to effect a rapid exchange of data or where I can get more information about how to do this?

*N P Beach  
88 Chatterbox Drive  
Charnobol  
Leam  
CV11 3BY*

Joining two Dragon 32's is simple, via the RS232C sockets, but joining two 32's is more difficult. You cannot directly connect the data buses of the two machines from the cartridge port — to do so would probably mean the end of both machines!

Your best bet is probably to purchase, or build, two I/O ports to plug into the cartridge ports and then link the Dragons via a length of ribbon cable. These ports are available from about £30 each.

## Problem String

The following line keeps giving me an FC (ERR) message when the whole program is run:

```
1380 IF MID$(TS,K1,50,1)
  THEN K3=K3+1: GOTO 1250
```

I just can't seem to work out what the error is. Could you help me please?

*Steven Gomers  
24 Chatterbox Ave  
Licham Road  
Bedford  
MK43 7AD*

The MID\$ command can be used to return any section of a string variable, even a non-existent section it will return a null string. The only time MID\$ will complain is if the start position — given by the variable K3 in your program — is greater than 255 or less than 1. The error is probably caused by K3 reaching 255 as there seems to be no limit on its value.

The Dragon manual also tends to point out that the MID\$ command can be used on the left of an expression to change sections of a string, as in: MID\$(A(1,3,3))="123". This can often be very useful indeed, saving much concatenation of strings.



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IT'D LIKE to begin this month by apologising to the people who I don't get round to mentioning in the columns, despite my having written to them promising to try to squeeze their letter in if there's space. The simple reason is that there's never enough space. This month, for example, I've received two adventures only recently on the market, another adventure written by a reader, the latest bulletin from The Adventurers Club Ltd, the usual few dozen brief letters and the usual dozen or so longer epistles containing clues by the score for sharing with other readers. And I've already needed a paragraph explaining about the task of space!

First, then, another quick mention for The Adventurers Club, whose latest dossier will be of interest as it carries a lengthy review of, and a complete solution to, *Black Sanctuary*. That's in addition to the rest of the reviews, hints, letters and so on that pack to 24 pages. With 10 per cent of its membership being Dragon owners, it's worth checking out if you monthly fix with Dragon (user can't enough. Phone 01-794 1281 for details).

## Beginners

Geoff Smith of Cheshire writes to agree with the reader who recently asked for more tips for beginners, and I suppose it's true that I do tend to forget that there are new people reading the column each month, not familiar with older games or unable to understand how some of the solutions work. Geoff was also a little puzzled as to why the clues I give are written backwards — well, it's not as that you can type them in backwards if they don't work the right way round, it's just to prevent someone else who's playing the same adventure from accidentally seeing it in case they don't want to.

A Mr P. Nugget of Ilkham, Manchester, asks me "in general, is there a way through the various mazes in adventure games or is the object just to get out of the maze again?" Let's look at that question as this month's advice for beginners, then. There's no one hard and fast rule about mazes, they're just one of the frequent features of adventure games, and can be there for different reasons. The majority are probably there just to fool you and see if you can find your way out again, and with most you'd find that you'd probably come out

where you went in, but being extra careful whilst you go in future. Some will have another exit which you must locate in order to reach a new area of the game, and some will contain an object (or objects) which you have to find before you get out again. Others will contain creatures or traps that are better avoided.

## Amazing

A good maze can be enjoyable simply because you don't quite know what to expect each time, as with the adventure itself. It's one of the problems you have to work out, with a common way of mapping a maze being by the use of the objects you're carrying. "You are lost in the forest" will be a typical maze description. No matter which direction you type in, you probably get the same description again. Sometimes, this means you've moved to a different location which has an identical description, and sometimes you've simply been taken back to the same location. You could try going North for eighteen moves, and still be in the same place, which is about as much use as trying to get anywhere on an exercise bike. If/As if you drop an object in a location, you can check whether you're actually moving elsewhere or staying put, in which case the object will still be there. In many mazes you find that these of the exits actually return you to the same place, with the fourth taking you somewhere else, and then that's repeated again and again.

A seemingly enormous maze can be made up of just four or five apparently identical locations, but you can slowly map these out provided you are carrying at least two or three objects, and also save your position as soon as you know you are in a maze, just in case you do get completely lost (and that happens to us all). Some programmes will be one step ahead of you and move objects round if you try to drop them, or they'll have a floor come in and steal them, or perhaps cover the floor with mist or swamp so that anything you drop immediately disappears. I must admit that I don't like this kind of thing as you have to find your way out by persistence and luck. A good maze should always have a way of solving it, no matter how devious or tricky the process.

This brings me to *Castle Blackstar*, a Dragon adventure I'd never heard of, till a reader wrote in to say that they had solved it.

Not many other people have mentioned it at all, which is a pity because it's an excellent adventure, as I can see now that the publishers have sent me a copy. This has a forest maze right at the start of the game, and if you wander in there with no objects you are immediately lost. Better to set off in another direction and arm yourself with a few things first, and then if you go down to the woods that way you'll be sure of a few surprises.

This text-only game revolves around you having to find a magic orb and return it to a princess, though to score the 250 points that are going begging you must also overcome all the problems and cleanse all the treasures of their evil, which will take more than a quick dip in *Peril*, I bet. The text is very lengthy and atmospheric, and the game incorporates some very nice features. As well as being able to save to tape, you can use the `PRERECE` command to save your position to memory and call it back at any point with `UNPRERECE`. There's also a `WPSAVECE` command, giving you full descriptions for each location on each visit, or `QUIET` which only gives you the full version first time round, to speed up moving about. The vocabulary, too, is extensive, and in order to enter a building I was able to use `ENTER`, `ENTER BUILDING`, `ENTE` or just `IN`.



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Wintersoft is the first of a new range of games for the Amiga. The first of these is 'WINTERSOFT', a new range of games for the Amiga.

The early locations are in and around the gates of the title, though you should soon discover at least one way into a network of underground passages, provided you've discovered our old friend the lamp, and our even older friend the oil to put in the lamp. I wish there were more space to give you some idea of the large scale of this adventure, too, but all I can do is recommend you buy it at £5.00 on tape or £6.00 on disk (Dragon Data drive) from SCR Adventures, 5 Christchurch Road, Buntingford, Surrey KT6 8LL.

I was slightly less impressed by Sam Buck, from Stratford, 2 Main Street, Frodsham, Cheshire at £5.75. It begins well enough, with a beautifully impressionistic loading screen of the Statue of Liberty against a New York skyline, this then being replaced by a cartoon strip style shot of our hero, Sam Buck, the New York private eye. After a little mood music and some optional instructions, you're into the game itself, and both this month's titles have sensibly redesigned the character set for ease of reading and a better screen layout.

## Mystery

As Sam Buck you start the game in your office, filled with the smell of stale coffee, and a murder mystery to unravel on behalf of the type of blonde who always seems to walk into the office of private eyes everywhere. You wander out into the streets of New York (or New York, to borrow the game's Brooklyn vocabulary). The weather's a bit inconsistent, raining in one location and too warm in the next, and the vocabulary's not half as comprehensive as *Conan* (Buckster). At one point I went into the apartment of my informant, Data-

Malone, to see what info he could give me on the crime, and Data told me "Pay out 12 bucks first, okay?" What would you reply to that? I tried OKAY, YES, AGREE, PAY TEN BUCKS, OFFER MONEY, GIVE MONEY, GAVE TEN BUCKS, SAY YES, SAY OKAY, in fact everything I could think of but all to no avail.

I didn't care, as I never do, for the lack of a SAVE facility, or for the instructions (which include some unusual commands) not being printed on the cassette tape, or the fact that you can only make a certain number of moves before you die of starvation. I've found one restaurant, the entrance to which only seems to appear once you've gone past it and returned, but it's frustrating to find that you need to eat when you're wandering off checking out new locations, and so instead you have to start thinking about finding some other source of food. Fail to do it and you have to start the game afresh, which is annoying, though the game

does have plenty of humorous touches to it and perhaps I'd like it more if there weren't so many other good adventures around at the moment.

Such as *Justposition*, of course, which John Baker of Bridgford has already completed. He offers a few clues, such as "brown before green" and "blue before yellow," and I think I'll be revealing some more clues for this title next month.

Thanks to reader W. G. Jones for pointing out that you can still buy *Madness* and the *Minotaur* (which lots of people had asked me about) from Maplin Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex S66 6LR for £4.95 including p & p. Finally, if anyone wants an adventure that *total* (p & p) write to Shanon Services, Haverhill 211 Street, Cammel 20 000, Israel.

All this space and I'm glib with a pile of very helpful reader's letters, all untouched. Maybe next time — famous last words!

## Adventure Contact

To help puzzled adventurers further, we are installing an Adventure Helpline — simply fill in the coupon below, stating the name of the adventure, your problem and your name and address, and send it to Dragon User Adventure Help-

line, 12113 Little Newport Street, London WC2H 9PP. As soon as enough entries have arrived, we will start printing them in the magazine.

Don't worry — you'll still have Adventure Trail to write to as well!

Adventure  
Problem:

Name:  
Address:

Feb 88

## Adventure Contact

**Adventure:** Franklin's Tomb.  
**Problem:** Don't know how to stop the water at Aqueduct after pressing button. **Name:** William Tibbory. **Address:** The Cottars, Harby Lane, Melton Mowbray, Leicestershire.  
**Adventure:** Sea Quest and Starjammers. **Problem:** Everything. **Name:** Michael Peirson. **Address:** 80 Playmouth Road, Bredonville, Bristol, BS2 4QR.  
**Adventure:** Castle Adventure.  
**Problem:** How do I enter the dark room? How do I open the small box? With what do I break the glass over the North exit? **Name:** Chris Bill.  
**Address:** Basement Flat, 69 Clarendon Road, Weymouth, Dorset, DT4 7JF.  
**Adventure:** Castle Adventure.  
**Problem:** Cannot get out of the Walled Garden, also cannot get trapdoor to open in chapel. **Name:** Mark Coops. **Address:** 16 Wilton Drive, Bear Heath, Stockton-on-Tees,

ST5 7JZ.  
**Adventure:** Black Sanctuary.  
**Problem:** How am I supposed to make the altar to explode the evil in the Abbey? **Name:** Simon Foster. **Address:** 14 Girdlestone Place, Heysham, Lancs.  
**Adventure:** Sheranigans.  
**Problem:** What to do at port-towers at Undergoose stations and how to read the sign. **Name:** Daniel Schwaids. **Address:** 8 Cox Crescent, Dunroch, Rye, Wiltshire, CV22 6GR.  
**Adventure:** Black Sanctuary.  
**Problem:** I can't complete the adventure without my lantern turning out. **Name:** Anne. **Address:** The Cottars, Harby Lane, Melton Mowbray, Leicestershire.  
**Adventure:** Keys of the Wizard. **Problem:** I can't find the sanctuary to put my treasure in. **Name:** Peter Kaele. **Address:** 7 Rochester Avenue, Fellingham, Middles-

twich 46A.  
**Adventure:** Scryge. **Problem:** What is the right transporter co-ordinated to go to the arena? **Name:** Lasse Lohrborg. **Address:** Tallmagnus 440, 10300 Karas, Finland.  
**Adventure:** O Diabolo. **Problem:** I can't open the box. **Name:** S. L. Taylor. **Address:** 16 Pembroke Gardens, Welbourne, Wiltshire.  
**Adventure:** Sea Quest. **Problem:** I have a gold anchor and a credit card for Michael Nelson Jr — what do I do now? **Name:** E. A. Preston. 51 Mapledown Road, Summersdale, Chichester, West Sussex, PO19 4RP.  
**Adventure:** Rat Trilogy. **Problem:** I can't get past the giant Zombie. Can you send me the full quest? **Name:** Michael Bringley. **Address:** 3 Ladywell Road, Kintore, Aberdeenshire, AB25 5UD.  
**Adventure:** Pettigrews Diary. **Problem:** Cannot avoid burn-

ing. No progress despite receiving help. **Name:** G. R. Guthrie. **Address:** 83 Woodbrook Road, Sedburgh, Devon, EX10 8SD.  
**Adventure:** Caverns of Doom. **Problem:** What do you do after swimming and end up in the large cavern? What do you do when flash goes out? **Name:** Jeremy Barker. **Address:** 11 Silver Birch Avenue, Culverstone, Macclesham, Kent, DA13 0TP.  
**Adventure:** Return of the Ring. **Problem:** How do I get the chest open in Helm's Tomb? Where is Moria the Elf? Can't find him. **Name:** Denise Biggs. **Address:** 38 Gosford Place, Crumlington, Northumberland, NE23 6PU.  
**Adventure:** Return of the Ring. **Problem:** How to get the red pass and what use is the yellow pass? **Name:** Darren Biggs. **Address:** 58 Gosford Place, Crumlington, Northumberland, NE23 6DU.

Reichman, R. 1993. *Phonology*. Chicago: University of Chicago Press.

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# Firmware

Brian Cudge explores the Dragon's ROM in a special series which builds up month by month into a firmware manual.

This month we look at the various firmware 'vectors' used for Reset, Interrupts and Expansion.

## Reset Vector

The hardware is configured so that a reset always jumps to the ROM. The R040 routine first of all checks location 113, if this is not set to its default then a full Cold Start is performed. Next the address of the reset routine is fetched from locations 114/115, and as a double check for power up, the reset routine checks that the first instruction of the reset routine is a NOP. If it is not then a Cold Start is performed. The standard reset routine resets the test screen and display, stops the cassette and disk, resets the stack and enters the Command mode.

## Interrupt Vectors

The standard IRQ interrupt is caused by the Field Sync of the TV, and occurs 50 times a second. This is used to update the TIMER location (374275) and to decrement the general purpose count down facility (141/142). With Dragondos attached, the IRQ also enables control the disk motor off delay.

The IRQ interrupt is caused by one of the two inputs — either a cartridge is present, or an ACK signal has been received from the Printer. The standard IRQ ROM routine checks that the interrupt was caused by a cartridge by looking at the Cartridge flag (bit 7 in SFF23) and returns if it is not. If a cartridge is present then after a delay a cold start is performed to the cartridge. With Dragondos attached the ROM routine simply clears the interrupts by accessing locations SFF21 and SFF23 and then returns.

The RAM is not normally used, and does not have a ROM routine. It is used by the Dragondos cartridge and a ROM routine is set up to deal with it — the RAM vector should never be changed with Dragondos as it will then be impossible to access the disks correctly.

The 4809 CPU allows for three software interrupt routines. The Basic ROM does not use any of these and does not have any routines to deal with them — they are available to the user. The CPU vectors are mapped from the ROM into locations SFFFE to SFFFF and are not alterable. These point to Extended page RAM locations which can be patched by users. The first byte should always be a JMP instruction, followed by the address of the routine.

The RAM vectors for interrupts are as follows:

394-398	SFF13Jump Vector
399-403	SFF14Jump Vector
404-408	SFF15Jump Vector
409-413	SFF16Jump Vector
414-418	SFF17Jump Vector
419-423	SFF18Jump Vector

## Expansion Vectors

There are 35 expansion vectors. These are three bytes each and normally contain RTS instructions. They can be patched with a JMP instruction to expand the system —

they are used by Dragondos for example just before a character is output — this could be patched to provide a customised screen driver.

Note that Device numbers are allocated as follows, and that the current device is stored in DEVN — location 111.

- 0=YOU,
- 1=CASSETTE,
- 2=PRINTER

## 358 Device Open

Called immediately before an OPEN command is executed.

## 363 Device Number

Called whenever a Device Number is verified. It can be patched so that normally out of range numbers can be used — eg for disk files.

## 366 Device Initialization

Called immediately before setting up the current device parameters in locations 109 to 10B.

## 369 Output Character to DEVN

Called immediately before outputting the character in the A register to DEVN.

## 362 Input Character from DEVN

Called immediately before inputting a character from device DEVN into the A register.

## 365 Input File

Called before inputting from a file using INPUT.

## 368 Output File

Called before outputting to a file using PRINT.

## 371 Close All Files

Called before all files are closed — actually action is only taken if the cassette is open.

## 374 Close File

Called before a device is closed by the CLOSE command — action is only taken if the device number in DEVN is -1.

## 377 Command Interpreter

Called before interpreting the tokens in the A register as a command. This is used by Delta Dos for adding new commands to Basic.

## 380 Re-Request Input

Called before re-requesting more data from the Keyboard, just before the '??' prompt.

## 383 Check Keys

Called before the keyboard is scanned for Break and Shift (r). The keyboard is not scanned if the DEVN is -1. This vector can be patched to disable BREAK.

## 386 Line Input File

Called before a LINE INPUT command is executed on the current DEVN.

## 389 Close File and Command

Called before closing an ASCII file just read in as a Basic program by CLAMP and returning to Command Mode.

## 392 Check EOF

Called before checking for EOF for the current DEVN.

## 395 Evaluate Expression

Called before evaluating an expression.

## 398 User Error Trap

Can be patched by the 'user' (ie a Basic Program) to trap error messages.

## 401 System Error Trap

Can be patched by the 'system' (ie Basic extension ROMs) to trap or extend error handling, this is used by Dragondos.

## 404 RUN Link

Called when a RUN command is about to be executed. Patched by Dragondos to allow a disk filename to be specified after the RUN command.

## 407 Reset Basic Memory

Called from two routines in the ROM — before the Basic Memory Vectors are changed, by entering or editing lines, or loading programs etc.

## 410 Get Next Command

Called before reading in the next Basic command to be executed during runtime.

## 413 Assign String Var

Called before assigning a string to a string variable.

## 416 Screen Access

Called before the GUS, GET and PUT commands are executed.

## 419 Tokenize Line

Called before an ASCII line is tokenized to internal Basic format.

## 422 Detokenize Line

Called before a tokenized line is converted to ASCII characters.

## Next Month: Miscellaneous Firmware Functions & Routines

This is the sixth in Brian's series on the Dragon's ROM routines. Next month he will be covering Firmware Vectors. If you have missed any of the previous issues, they can be obtained from Dragon User, Back Issues, 12-13 Little Newport Street, London WC2H 7PP, at £1.25 each, inclusive of postage, packing and administration charges.

Just to remind you of previous months:  
Sep 85 — Cassette Operating System  
Oct 85 — CDS Firmware Routines  
Nov 85 — Text Manager Routines  
Dec 85 — Graphics and Sound  
Jan 86 — Variations

# Competition Corner

Answers to Competition Corner,  
Dragon User, 10-16 Little Newport  
Street, London WC2H 1PP.

## Seeing stars

THE RECENT proximity of Halley's comet has led to a greater than usual interest in matters astronomical, although now that it is heading back into the depths of space, comet watchers will have to wait until the year 2062 AD — the date of its next predicted return.

Professional astronomy is a field of study which is now heavily dependent on computers, and there is little reason why any amateur astronomer, who is also adept at programming, should not use their computers as a valuable aid. A quick glance through the pages of any astronomical almanac will reveal columns of figures denoting the R.A. (right ascension) and declination used for locating the various stars and planets on given dates, and anyone with understanding of celestial mechanics could, no doubt, produce a program to display a star map for any date, time, and location. This would be a twentieth-century version of the orrery — those mechanical models used by early astronomers to show the movement of certain planets round the sun.

On a less complex level, readers might be interested in writing their own program based on the following calculations which determine the moon's age (phase) on any given date. The moon has a diameter of 2160 miles and orbits the earth at a mean distance of 238,857 miles. It rotates on its own axis every 27.32 days, which is also the time that it takes to orbit the earth. It is

for this reason that we can only see one side of the moon, and the period 27.32 days is known as a sidereal month. However, the phases of the moon are related to its synodic month, that is, the period between one new moon and the next. This is a period slightly in excess of 29½ days.

The calculation which follows is taken from a very old book on astronomy, and although the theory behind it is rather obscure, it does give surprisingly accurate results. In order to demonstrate its use, the calculation for finding the phase of the moon on St. Valentine's day (14th February 1986) is given in Table One.

This final remainder tells us that on the given date the moon will be just three days after new moon. Note that a full moon will be at age 14.15 days, and a new moon at 0.09 days.

Adapting the above method into a computer program should not be too difficult, and as a check for accuracy (in the programming) try the following dates:

Group 'A' — April 18th 1986, October 3rd 1986, March 28th 1987, September 23rd 1987, and March 16th 1988.

Group 'B' — April 24th 1986, October 17th 1986, October 7th 1987, August 27th 1988, and February 20th 1989.

All those dates in group 'A' are days on which there will be an eclipse of the sun, and those in group 'B', an eclipse of the



moon. As an eclipse of the sun can only occur when the moon is new, and an eclipse of the moon can only occur when it is full, these dates can be used as a useful check of the program.

### Competition

As it is almost St. Valentine's Day, perhaps I might be allowed the following message to my wife:

G O R D O N  
L O V E S  
D E N I S E

It seems a pity to spoil the romance of the moment, but the message as shown forms an alphametic sum. The sum is a simple addition, not quite so simple however, is substituting digits for letters — a different letter denoting a different digit, the same letter denoting the same digit whenever it occurs. If this is done correctly it will work out exactly.

Can you find the solution? (Note that in puzzles of this type you are not allowed to put a zero as a leading digit e.g. in this case as '10', '1', or '0').

Table One

Divide the year by 18 and note the remainder.	1986/18 = 110:10
Multiply this remainder by 11.	10*11 = 110
Divide by 36, and again take the remainder.	110/36 = 3:20
Add the number of centuries in the year divide by 3 (ignoring remainder).	20 + 4 = 24
Add the number of centuries in the year divided by 4 (ignoring remainder).	24 + 4 = 28
Add 8.	28 + 8 = 36
Subtract number of centuries in year.	36 - 19 = 17
Add month (Jan = 1, Dec = 12).	17 + 2 = 19
Add date.	19 + 14 = 33
Finally, divide by 30 and take remainder.	33/30 = 1:3

### Prize

This month, we are offering 26 prizes courtesy of Incentive Software — in fact they are offering you the choice of any one of their pre-Moon Cresta Dragon releases.

### Rules

To win an Incentive game, you must first solve the answer to the above competition, and demonstrate how you solved it with the use of a Basic program written on your Dragon. Please do not send in cassettes containing your program. Make sure your name and address are clearly printed on your entry and mark

the envelope "February Competition". Envelopes which do not state which month you are entering for will be disqualified.

As a tie breaker for this month, Ian Andrew of Incentive has set you a further task. How many dedicated space arcade game machines can you name? The 25 correct answers that can name the most will win a prize... and don't forget to nominate which game you would like to have.

### November Winners

The twenty winners of the November competition have won themselves

copies of Dark Star by Design Design. Congratulations go to the following:

Mr Spencer of 21 Wheelock Drive, Winsford, Cheshire, G L Naylor of Cardigan, Simon Aubrey of Swindon, Terry Potter of Chislehurst, M Owens of Tonbridge, M Ingham of Leeds, Cayula Simon of Blois, France, M W Stanton of Trowbridge, R P Wilson of Swentley, P L Bates of St Albans, R H E Bottoms of Galley, Andy Grubb of Royton, Oldham, A J Parsons of Whitton, Paul Priestland of Lechlade, R Crowther of Rotherham, R J Tolman of Sale, P Fairbairn of Kilmarston, Charles Galy of Windsor Hill, Co. Cork, M Hoops of Washington, C R Dean of Emsfield.

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